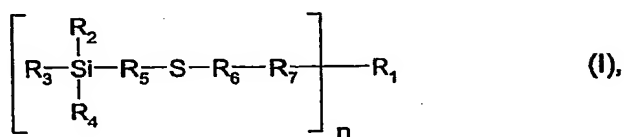


What is claimed is:

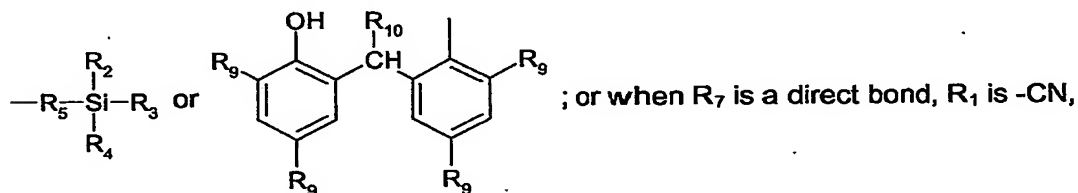
1. A composition comprising

- a) a naturally occurring or synthetic elastomer susceptible to oxidative, thermal, dynamic, light-induced and/or ozone-induced degradation,
- b) a white reinforcing filler, and
- c) as coupling agent, at least one compound of the formula I



wherein, when n is 1,

R₁ is hydrogen, C₁-C₂₅alkyl, C₁-C₂₅alkyl substituted with furyl, morpholine, C₁-C₄di-alkylamino, C₁-C₄trialkylammonium or M⁺ O₃S⁻; C₂-C₂₅alkyl interrupted by oxygen; C₅-C₁₂cycloalkyl, C₂-C₂₅alkenyl, unsubstituted or C₁-C₄alkyl-substituted phenyl; C₇-C₁₂phenoxyalkyl, unsubstituted or C₁-C₄alkyl substituted C₇-C₉bicycloalkyl;



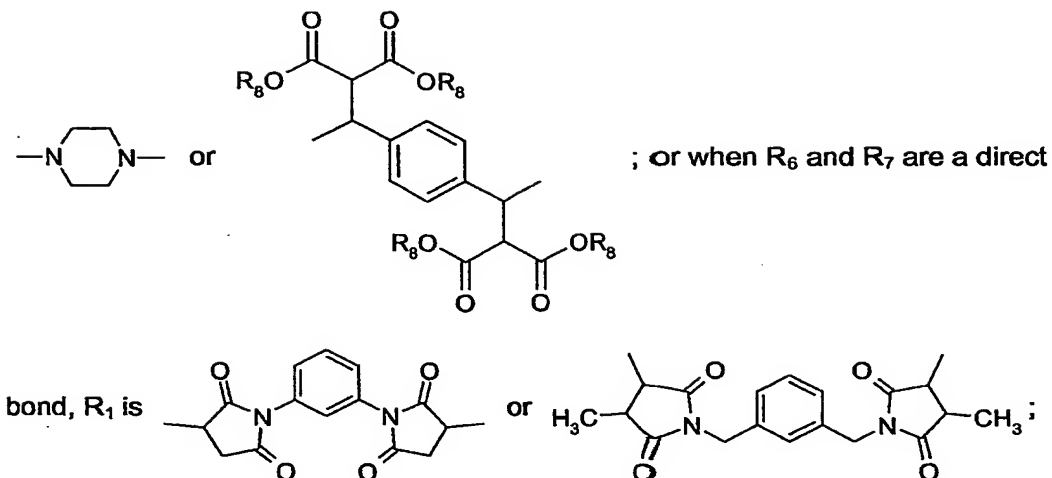
-SOR₈, -SO₂R₈, -NO₂ or -COR₈,

when n is 2,

R₁ is C₁-C₂₅alkylene, C₁-C₂₅alkylene substituted with C₁-C₄alkyl; C₂-C₂₅alkylene substituted with C₁-C₄alkyl and interrupted by oxygen; C₂-C₂₅alkylene interrupted by



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R₂, R₃ and R₄ are each independently of the others C₁-C₂₅alkyl, C₂-C₂₅alkyl interrupted by oxygen; C₅-C₁₂cycloalkyl, C₂-C₂₅alkenyl, unsubstituted or C₁-C₄alkyl-substituted phenyl, C₇-C₉phenylalkyl, C₁-C₂₅alkoxy, C₃-C₂₅alkoxy interrupted by oxygen; C₅-C₁₂cycloalkoxy, C₂-C₂₅alkenyloxy, unsubstituted or C₁-C₄alkyl-substituted phenoxy, C₇-C₉phenylalkoxy, halogen, C₂-C₂₅alkanoyloxy or unsubstituted or C₁-C₄alkyl substituted benzoyloxy; with the proviso that at least one of R₂, R₃ or R₄ is C₁-C₂₅alkoxy, C₃-C₂₅alkoxy interrupted by oxygen; C₅-C₁₂cycloalkoxy, C₂-C₂₅alkenyloxy, unsubstituted or C₁-C₄alkyl-substituted phenoxy, C₇-C₉phenylalkoxy, halogen, C₂-C₂₅alkanoyloxy or unsubstituted or C₁-C₄alkyl substituted benzoyloxy;

R₅ is C₁-C₂₅alkylene, C₅-C₁₂cycloalkylene, unsubstituted or C₁-C₄alkyl substituted phenylene;

R₆ is a direct bond, C₁-C₂₅alkylene; or C₁-C₂₅alkylene substituted with C₁-C₂₅alkyl, C₂-C₂₅alkoxycarbonyl or phenyl;

R₇ is a direct bond or $-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}_{13}$, with the proviso that, when R₇ is a direct bond and

n is 1, R₆ is not a direct bond; and with the proviso that, when R₇ is $-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}_{13}$, R₆ is not a direct bond;

R₈ is C₁-C₂₅alkyl, C₂-C₂₅alkyl interrupted by oxygen; C₅-C₁₂cycloalkyl, C₂-C₂₅alkenyl, C₂-C₂₅alkinyl, C₇-C₉phenylalkyl, unsubstituted or C₁-C₄alkyl-substituted phenyl,

R₉ is C₁-C₅alkyl,

R₁₀ is hydrogen or C₁-C₄alkyl,

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R_{11} and R_{12} are each independently of the other hydrogen, CF_3 , C_1 - C_{12} alkyl or phenyl, or R_{11} and R_{12} , together with the carbon atom to which they are bonded, form a C_5 - C_8 cycloalkylidene ring that is unsubstituted or substituted by from 1 to 3 C_1 - C_4 alkyl groups,

R_{13} is oxygen or $-N(R_{14})-$,

R_{14} is hydrogen or C_1 - C_{12} alkyl,

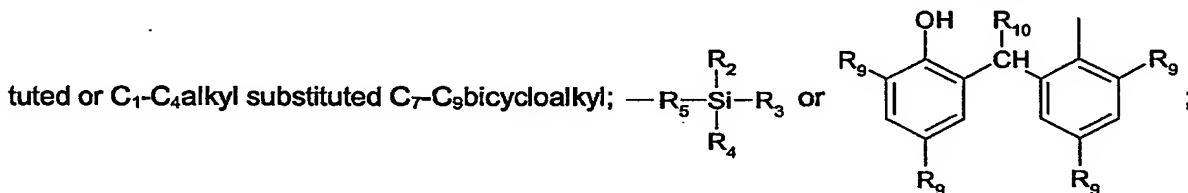
M is sodium, potassium or ammonium, and

n is 1 or 2; or an oligomeric hydrolysis product of the compound of the formula I.

2. A composition according to claim 1, wherein

when n is 1,

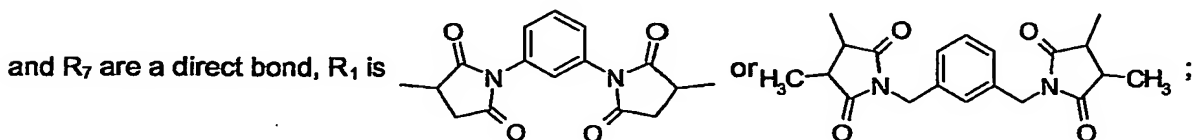
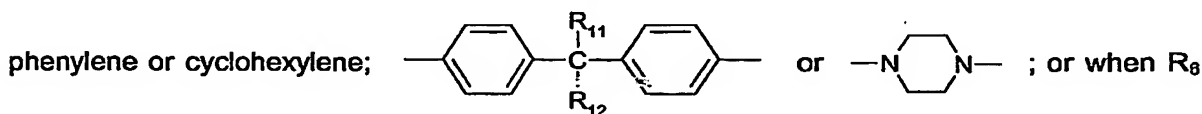
R_1 is hydrogen, C_1 - C_{18} alkyl, C_1 - C_{18} alkyl substituted with furyl, morpholine, C_1 - C_4 dialkylamino, C_1 - C_4 trialkylammonium or $M^+ O_3S^-$; C_2 - C_{18} alkyl interrupted by oxygen; C_5 - C_8 cycloalkyl, C_2 - C_{18} alkenyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; C_7 - C_{10} phenoxyalkyl, unsubstituted or C_1 - C_4 alkyl substituted C_7 - C_9 bicycloalkyl;



or when R_7 is a direct bond, R_1 is $-CN$, $-SOR_8$, $-SO_2R_8$, $-NO_2$ or $-COR_8$,

when n is 2,

R_1 is C_1 - C_{18} alkylene, C_1 - C_{18} alkylene substituted with C_1 - C_4 alkyl; C_2 - C_{18} alkylene substituted with C_1 - C_4 alkyl and interrupted by oxygen; C_2 - C_{18} alkylene interrupted by oxygen, sulfur,



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R₂, R₃ and R₄ are each independently of the others C₁-C₁₈alkyl, C₂-C₁₈alkyl interrupted by oxygen; C₅-C₈cycloalkyl, C₂-C₁₈alkenyl, unsubstituted or C₁-C₄alkyl-substituted phenyl, C₇-C₉phenylalkyl, C₁-C₁₈alkoxy, C₃-C₁₈alkoxy interrupted by oxygen; C₅-C₈cycloalkoxy, C₂-C₁₈alkenyloxy, unsubstituted or C₁-C₄alkyl-substituted phenoxy, C₇-C₉phenylalkoxy, halogen, C₂-C₁₈alkanoyloxy or unsubstituted or C₁-C₄alkyl substituted benzoyloxy; with the proviso that at least one of R₂, R₃ or R₄ is C₁-C₁₈alkoxy, C₃-C₁₈alkoxy interrupted by oxygen; C₅-C₈cycloalkoxy, C₂-C₁₈alkenyloxy, unsubstituted or C₁-C₄alkyl-substituted phenoxy, C₇-C₉phenylalkoxy, halogen, C₂-C₁₈alkanoyloxy or unsubstituted or C₁-C₄alkyl substituted benzoyloxy;

R₅ is C₁-C₁₈alkylene, C₅-C₈cycloalkylene, unsubstituted or C₁-C₄alkyl substituted phenylene;

R₆ is a direct bond, C₁-C₁₈alkylene; or C₁-C₁₈alkylene substituted with C₁-C₁₈alkoxy, C₂-C₁₈alkoxycarbonyl or phenyl;

R₇ is a direct bond or $\text{---}\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{---R}_{13}$, with the proviso that, when R₇ is a direct bond and n is 1,

R₈ is not a direct bond; and with the proviso that, when R₇ is $\text{---}\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{---R}_{13}$, R₈ is not a direct bond;

R₈ is C₁-C₁₈alkyl, C₂-C₁₈alkyl interrupted by oxygen; C₅-C₈cycloalkyl, C₂-C₁₈alkenyl, C₂-C₁₈alkinyl, C₇-C₉phenylalkyl, unsubstituted or C₁-C₄alkyl-substituted phenyl,

R₉ is C₁-C₅alkyl,

R₁₀ is hydrogen or methyl,

R₁₁ and R₁₂ are each independently of the other hydrogen, CF₃, C₁-C₈alkyl or phenyl, or R₁₁ and R₁₂, together with the carbon atom to which they are bonded, form a C₅-C₈cycloalkylidene ring that is unsubstituted or substituted by from 1 to 3 C₁-C₄alkyl groups,

R₁₃ is oxygen or -N(R₁₄)-,

R₁₄ is hydrogen or C₁-C₈alkyl,

M is sodium, potassium or ammonium, and

n is 1 or 2

3. A composition according to claim 1, wherein R₂, R₃ and R₄ are each independently of the others C₁-C₄alkyl or C₁-C₄alkoxy; with the proviso that at least one of R₂, R₃ or R₄ is C₁-C₄alkoxy.

4. A composition according to claim 1, wherein R₅ is C₂-C₄alkylene.

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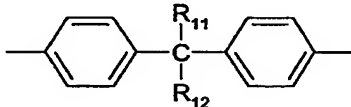

5. A composition according to claim 1, wherein
when n is 1,

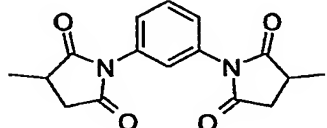
R₁ is hydrogen, C₁-C₁₈alkyl, C₁-C₁₂alkyl substituted with furyl, morpholine, C₁-C₄dialkylamino, C₁-C₄trialkylammonium or M⁺ O₃S⁻; C₂-C₁₂alkyl interrupted by oxygen; cyclohexyl, C₄-C₁₂-alkenyl, phenyl, C₇-C₁₀phenoxyalkyl, unsubstituted or C₁-C₄alkyl substituted C₇-C₉bicycloal-

kyl; $\text{—R}_5\text{—}\begin{array}{c} \text{R}_2 \\ | \\ \text{Si} \\ | \\ \text{R}_4 \end{array}\text{—R}_3$, or when R₇ is a direct bond, R₁ is -CN, -SOR₈ or -SO₂R₈;

when n is 2,

R₁ is C₂-C₁₂alkylene, C₂-C₁₂alkylene substituted with methyl; C₂-C₁₂alkylene substituted with methyl and interrupted by oxygen; C₄-C₁₂alkylene interrupted by oxygen, sulfur, phenylene or

cyclohexylene;  or ; or when R₆ and R₇ are a

direct bond, R₁ is ;

R₂, R₃ and R₄ are each independently of the others C₁-C₈alkyl, C₄-C₈alkyl interrupted by oxygen; cyclohexyl, C₂-C₁₂alkenyl, benzyl, C₁-C₈alkoxy, C₃-C₈alkoxy interrupted by oxygen; cyclohexyloxy, C₂-C₁₂alkenyloxy, phenoxy, benzyloxy, chloro, bromo, C₂-C₈alkanoyloxy or benzoyloxy; with the proviso that at least one of R₂, R₃ or R₄ is C₁-C₈alkoxy, C₃-C₈alkoxy interrupted by oxygen; cyclohexyloxy, C₂-C₁₂alkenyloxy, phenoxy, benzyloxy, chloro, bromo, C₂-C₈alkanoyloxy or benzoyloxy;

R₅ is C₂-C₈alkylene, cyclohexylene or phenylene;

R₆ is a direct bond, C₁-C₈alkylene; or C₁-C₈alkylene substituted with C₁-C₄alkyl, C₂-C₈alkoxy-carbonyl or phenyl;

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R_7 is a direct bond or $\text{—}\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{—}R_{13}$, with the proviso that, when R_7 is a direct bond and n is 1,

R_6 is not a direct bond; and with the proviso that, when R_7 is $\text{—}\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{—}R_{13}$, R_6 is not a direct bond;

R_8 is C_1 - C_{12} alkyl, C_2 - C_{12} alkyl interrupted by oxygen; cyclohexyl, C_2 - C_{12} alkenyl, C_2 - C_{12} alkinyl, benzyl or phenyl,

R_{11} and R_{12} are each independently of the other hydrogen or C_1 - C_8 alkyl, or R_{11} and R_{12} , together with the carbon atom to which they are bonded, form a cyclohexylidene ring that is unsubstituted or substituted by from 1 to 3 methyl groups,

R_{13} is oxygen or $\text{—}N(R_{14})\text{—}$,

R_{14} is hydrogen or C_1 - C_4 alkyl,

M is sodium or potassium, and

n is 1 or 2.

6. A composition according to claim 1, wherein
when n is 1,

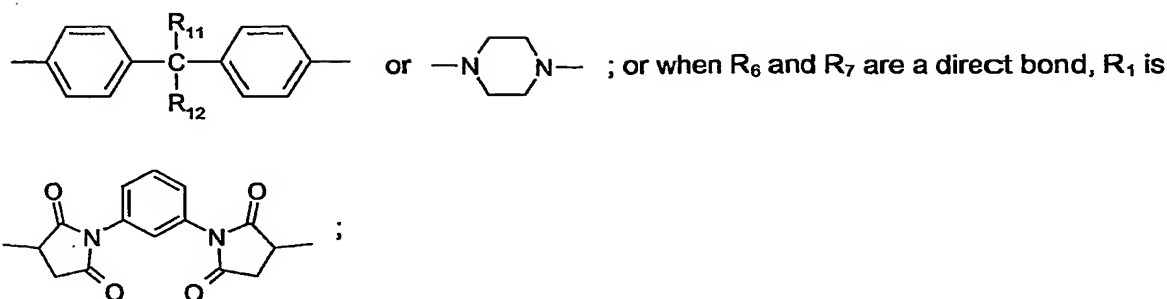
R_1 is hydrogen, C_1 - C_{18} alkyl, C_1 - C_8 alkyl substituted with furyl, morpholine, C_1 - C_4 dialkylamino, C_1 - C_4 trialkylammonium or $M^+ \text{—}O_3S\text{—}$; C_2 - C_8 alkyl interrupted by oxygen; cyclohexyl, C_4 - C_{10} alkenyl, phenyl, C_7 - C_{10} phenoxyalkyl, unsubstituted or C_1 - C_4 alkyl substituted C_7 - C_9 bicycloalkyl;

$\text{—}R_5\text{—}\overset{\text{R}_2}{\underset{\text{R}_4}{\text{Si}}}\text{—}R_3$, or when R_7 is a direct bond, R_1 is $\text{—}CN$, $\text{—}SOR_8$ or $\text{—}SO_2R_8$;

when n is 2,

R_1 is C_2 - C_8 alkylene, C_2 - C_8 alkylene substituted with methyl; C_2 - C_{10} alkylene substituted with methyl and interrupted by oxygen; C_4 - C_{12} alkylene interrupted by oxygen or sulfur;

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R_2 , R_3 and R_4 are each independently of the others $\text{C}_1\text{--C}_4$ alkyl, cyclohexyl, $\text{C}_2\text{--C}_6$ alkenyl, benzyl, $\text{C}_1\text{--C}_4$ alkoxy, cyclohexyloxy, $\text{C}_2\text{--C}_6$ alkenyloxy, phenoxy, benzyloxy, chloro, $\text{C}_2\text{--C}_4$ alkanoyloxy or benzoyloxy; with the proviso that at least one of R_2 , R_3 or R_4 is $\text{C}_1\text{--C}_4$ alkoxy, cyclohexyloxy, $\text{C}_2\text{--C}_6$ alkenyloxy, phenoxy, benzyloxy, chloro, $\text{C}_2\text{--C}_4$ alkanoyloxy or benzoyloxy;

R_5 is $\text{C}_2\text{--C}_6$ alkylene or cyclohexylene,

R_6 is a direct bond, $\text{C}_1\text{--C}_6$ alkylene; or $\text{C}_1\text{--C}_6$ alkylene substituted with methyl, $\text{C}_2\text{--C}_6$ alkoxycarbonyl or phenyl;

R_7 is a direct bond or $\text{---} \text{C}(=\text{O})\text{---R}_{13}$, with the proviso that, when R_7 is a direct bond and n is 1,

R_8 is not a direct bond; and with the proviso that, when R_7 is $\text{---} \text{C}(=\text{O})\text{---R}_{13}$, R_8 is not a direct bond;

R_8 is $\text{C}_1\text{--C}_8$ alkyl or $\text{C}_2\text{--C}_{12}$ alkenyl,

R_{11} and R_{12} are each independently of the other hydrogen or $\text{C}_1\text{--C}_6$ alkyl,

R_{13} is oxygen or $\text{---N(R}_{14})\text{---}$,

R_{14} is hydrogen or methyl,

M is sodium or potassium, and

n is 1 or 2.

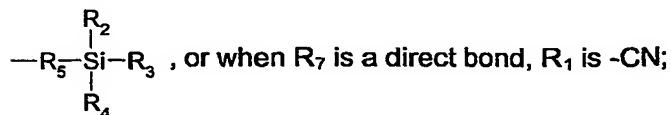
7. A composition according to claim 1, ~~wherein~~

when n is 1,

R_1 is hydrogen, $\text{C}_1\text{--C}_{18}$ alkyl, $\text{C}_1\text{--C}_4$ alkyl substituted with furyl, morpholine, $\text{C}_1\text{--C}_4$ dialkylamino, $\text{C}_1\text{--C}_4$ trialkylammonium or $\text{M}^+ \text{O}_3\text{S}^-$; $\text{C}_2\text{--C}_6$ alkyl interrupted by oxygen; cyclohexyl, $\text{C}_4\text{--C}_{10}$ al-

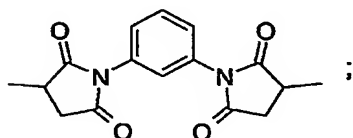
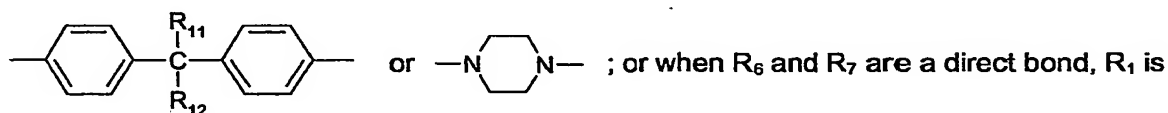
- 61 -

kenyl, phenyl; C₇-C₉phenoxyalkyl, unsubstituted or C₁-C₄alkyl substituted C₇-C₉bicycloalkyl;



when n is 2,

R₁ is C₂-C₆alkylene, C₂-C₄alkylene substituted with methyl; C₄-C₈alkylene substituted with methyl and interrupted by oxygen; C₄-C₈alkylene interrupted by oxygen;



R₂, R₃ and R₄ are each independently of the others C₁-C₄alkyl or C₁-C₄alkoxy; with the proviso that at least one of R₂, R₃ or R₄ is C₁-C₄alkoxy;

R₅ is C₂-C₄alkylene,

R₆ is a direct bond, C₁-C₃alkylene; or C₁-C₃alkylene substituted with methyl, C₂-C₃alkoxycarbonyl or phenyl;

R₇ is a direct bond or $\text{---}\overset{\text{O}}{\parallel}\text{C---R}_{13}$, with the proviso that, when R₇ is a direct bond and n is 1,

R₆ is not a direct bond; and with the proviso that, when R₇ is $\text{---}\overset{\text{O}}{\parallel}\text{C---R}_{13}$, R₆ is not a direct bond;

R₁₁ and R₁₂ are each independently of the other hydrogen or C₁-C₄alkyl,

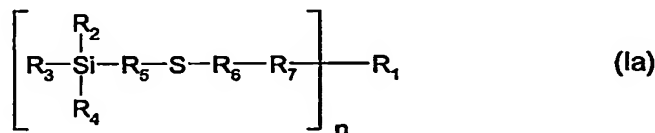
R₁₃ is oxygen or -N(R₁₄)-,

R₁₄ is hydrogen,

M is potassium, and

n is 1 or 2; or an oligomeric hydrolysis product of the compound of the formula Ia.

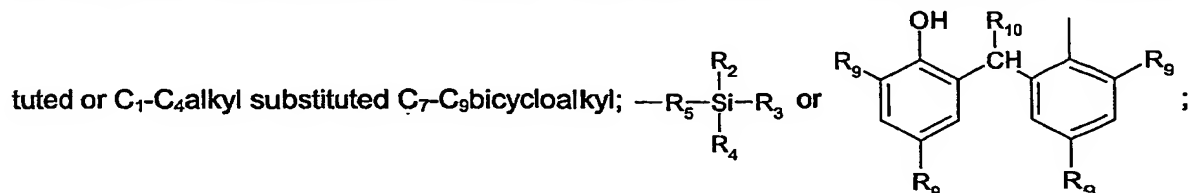
8. A composition according to claim 1, in which component a) is a natural or synthetic rubber or vulcanizate prepared therefrom.
9. A composition according to claim 1, in which component a) is a polydiene vulcanizate, a halogen-containing polydiene vulcanizate, a polydiene copolymer vulcanizate or an ethylene-propylene terpolymer vulcanizate.
10. A composition according to claim 1, wherein component (b) is silica or alumina, or a mixture of silica and alumina.
11. A composition according to claim 1, wherein component (b) is present in an amount of 1 to 40% based on the weight of component (a).
12. A composition according to claim 1, wherein component (c) is present in an amount of 0.01 to 10% based on the weight of component (a).
13. A composition according to claim 1, comprising in addition, besides components (a) and (b), further additives.
14. A composition according to claim 13, comprising as further additives, one or more components selected from the group consisting of pigments, dyes, levelling assistants, dispersants, plasticizers, vulcanization activators, vulcanization accelerators, vulcanizers, charge control agents, adhesion promoters, antioxidants and light stabilizers.
15. A composition according to claim 13, comprising, as further additives, phenolic antioxidants, aminic antioxidants, organic phosphites or phosphonites and/or thio-synergists.
16. A compound of the formula Ia



wherein, when n is 1,

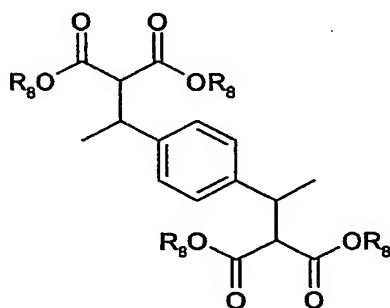
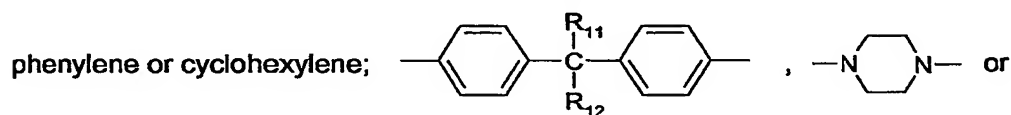
- 63 -

R_1 is hydrogen, C_1 - C_{25} alkyl, C_1 - C_{25} alkyl substituted with furyl, morpholine, C_1 - C_4 dialkylamino, C_1 - C_4 trialkylammonium or $M^+ \cdot O_3S^-$; C_2 - C_{25} alkyl interrupted by oxygen; C_5 - C_{12} cycloalkyl, C_2 - C_{25} alkenyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; C_7 - C_{12} phenoxyalkyl, unsubstituted or C_1 - C_4 alkyl substituted C_7 - C_9 bicycloalkyl; $-R_5-Si(R_2)(R_4)-R_3$ or

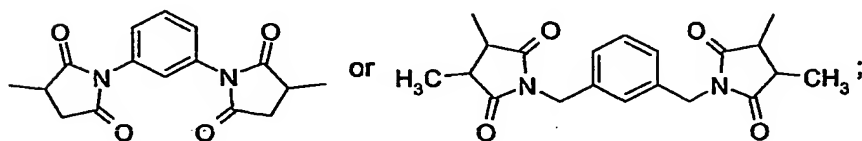


when n is 2,

R_1 is C_1 - C_{25} alkylene, C_1 - C_{25} alkylene substituted with C_1 - C_4 alkyl; C_2 - C_{25} alkylene substituted with C_1 - C_4 alkyl and interrupted by oxygen; C_2 - C_{25} alkylene interrupted by oxygen, sulfur,



; or when R_6 and R_7 are a direct bond, R_1 is



R_2 , R_3 and R_4 are each independently of the others C_1 - C_{25} alkyl, C_2 - C_{25} alkyl interrupted by oxygen; C_5 - C_{12} cycloalkyl, C_2 - C_{25} alkenyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl, C_7 - C_9 phenylalkyl, C_1 - C_{25} alkoxy, C_3 - C_{25} alkoxy interrupted by oxygen; C_5 - C_{12} cycloalkoxy, C_2 - C_{25} alkenyloxy, unsubstituted or C_1 - C_4 alkyl-substituted phenoxy, C_7 - C_9 phenylalkoxy, halogen, C_2 - C_{25} alkanoyloxy or unsubstituted or C_1 - C_4 alkyl substituted benzoyloxy; with the proviso that at least one of R_2 , R_3 or R_4 is C_1 - C_{25} alkoxy, C_3 - C_{25} alkoxy interrupted by oxygen;

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C₅-C₁₂cycloalkoxy, C₂-C₂₅alkenyloxy, unsubstituted or C₁-C₄alkyl-substituted phenoxy, C₇-C₉phenylalkoxy, halogen, C₂-C₂₅alkanoyloxy or unsubstituted or C₁-C₄alkyl substituted benzoyloxy;

R₅ is C₁-C₂₅alkylene, C₅-C₁₂cycloalkylene, unsubstituted or C₁-C₄alkyl substituted phenylene;

R₆ is a direct bond, C₁-C₂₅alkylene; or C₁-C₂₅alkylene substituted with C₁-C₂₅alkyl, C₂-C₂₅alkoxycarbonyl or phenyl;

R₇ is a direct bond or $\text{—}\overset{\text{O}}{\parallel}\text{C—R}_{13}$, with the proviso that, when R₇ is a direct bond and n is 1,

R₆ is not a direct bond; and with the proviso that, when R₇ is $\text{—}\overset{\text{O}}{\parallel}\text{C—R}_{13}$, R₆ is not a direct bond;

R₈ is C₁-C₂₅alkyl, C₂-C₂₅alkyl interrupted by oxygen; C₅-C₁₂cycloalkyl, C₂-C₂₅alkenyl, C₂-C₂₅alkinyl, C₇-C₉phenylalkyl, unsubstituted or C₁-C₄alkyl-substituted phenyl,

R₉ is C₁-C₅alkyl,

R₁₀ is hydrogen or C₁-C₄alkyl,

R₁₁ and R₁₂ are each independently of the other hydrogen, CF₃, C₁-C₁₂alkyl or phenyl, or R₁₁ and R₁₂, together with the carbon atom to which they are bonded, form a C₅-C₈-cycloalkylidene ring that is unsubstituted or substituted by from 1 to 3 C₁-C₄alkyl groups,

R₁₃ is oxygen or -N(R₁₄)-,

R₁₄ is hydrogen or C₁-C₁₂alkyl,

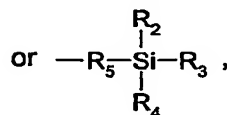
M is sodium, potassium or ammonium, and

n is 1 or 2; or an oligomeric hydrolysis product of the compound of the formula Ia.

17. A compound according to claim 16, wherein

when n is 1,

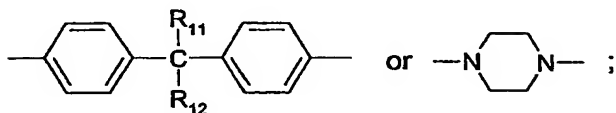
R₁ is hydrogen, C₁-C₁₈alkyl, C₁-C₄alkyl substituted with furyl, morpholine, C₁-C₄dialkylamino, C₁-C₄trialkylammonium or M⁺ O₃S⁻; C₇-C₉phenylalkoxy; C₂-C₂₅alkenyl, C₂-C₂₅alkinyl, phenyl; C₇-C₉phenoxyalkyl, unsubstituted or C₁-C₄alkyl substituted C₇-C₉bicycloalkyl;



when n is 2,

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R₁ is C₂-C₆alkylene, C₂-C₄alkylene substituted with methyl; C₄-C₈alkylene substituted with methyl and interrupted by oxygen; C₄-C₈alkylene interrupted by oxygen;



R₂, R₃ and R₄ are each independently of the others C₁-C₄alkyl or C₁-C₄alkoxy; with the proviso that at least one of R₂, R₃ or R₄ is C₁-C₄alkoxy;

R₅ is C₂-C₄alkylene,

R₆ is C₁-C₃alkylene; or C₁-C₃alkylene substituted with methyl, C₂-C₃alkoxycarbonyl or phenyl;

R₇ is $\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{R}_{13} \end{array}$,

R₁₁ and R₁₂ are each independently of the other hydrogen or C₁-C₄alkyl,

R₁₃ is oxygen or -N(R₁₄)-,

R₁₄ is hydrogen,

M is potassium, and

n is 1 or 2; or an oligomeric hydrolysis product of the compound of the formula Ia.

18. A process for ensuring the coupling of a white reinforcing filler to elastomer compositions reinforced by a white filler, which comprises incorporating into the elastomer at least one component (c) according to claim 1 and then vulcanizing the composition.

19. The use of component (c) according to claim 1 as coupling agent for ensuring the coupling of a white reinforcing filler with an elastomer.